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AUTHOR Pehrsson, Robert S.
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ABSTRACT

A study was conducted to determine the validity of the Op-In procedure in measuring global comprehension and to identify patterns of integrative thinking similar to those of pilot study subjects. The Op-In procedure is a type of cloze procedure that deletes every other sentence ending from a passage. Three sixth grade level scientific passages were presented to 96 seventh grade subjects. Each passage was presented in three different ways: a conventional cloze procedure, an Op-In procedure, and a comprehension question task with emphasis on the main idea and topic related connections (global comprehension). Student responses were grouped into one of five categories ranging from "same or similar to author's intent" to "fails to make sense, far off topic." The results indicated patterns divided evenly among the 96 subjects: (1) interactive, using both author's and reader's schemes for meaning; (2) projective, using mostly reader's own scheme for meaning; (3) fragmented, using local context without integrating any scheme; and (4) no pattern determined. Those categorized as interactive received the highest score. The results indicated that the Op-In procedure exposed global comprehension as well as deviations from them. (Materials used in the study are appended.) (HTH)

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AN INVESTIGATION OF COMPREHENDING DURING THE PROCESS OF SILENT READING:

The Op-In Procedure[1]

Robert S. Pehrsson

Introduction

Imagine standing in front of a theatre after viewing an exciting and enjoyable film. Further imagine that a friend meets you and asks you to tell her or him about the movie. The question would activate certain processes in your mind involving organizing and reconstructing the sequence of events, remembering the various episodes and information related to topics, subplots, etc. You might suppress trivial information and emphasize major events. You may search your memory for information in order to respond to more of the listener's questions. This is not an easy task and involves an emphasis on memory after the processes involving enjoying and understanding the movie have been put to rest. The main point is that this process involves something that differs from the actual enjoyment and understanding that took place during the process of viewing the film.

Traditional approaches to assessing reading comprehension are analogous to the situation presented above. Traditionally, a student reads a passage and then, having finished, is questioned. There may be value to this way of measuring comprehension, but this after-the-fact approach may involve processes which differ substantially from the actual process of comprehending which takes place as we are actually reading (or watching a film).

1 This investigation has been supported, in part, by an Idaho State University Grant No. 486.

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The cloze procedure has been used more recently as an approach to assessing comprehending. One of the values of the cloze procedure would appear to be that it deals with the interaction between the reader and the text during reading, not after the process is complete as in traditional assessments. However, before concluding that the cloze procedure is a direct measure of comprehending, we would do well to discuss some conflicting results of research in this area.

Cloze Procedure

It does appear that the cloze procedure seems to tap some processes related to comprehending. Rankin (1965) found cloze test results correlated in the .70-.90 range with standardized comprehension tests. Jongsma (1980), in reviewing research on the cloze, stated, "The cloze is most effective in developing reading comprehension." (p. 20). However, Grundin and others (1981) suggested that the cloze procedure may not be a valid measure of global comprehension. In a study across three languages, it was found that cloze comprehension and global comprehension have a common variance which is about thirty-five percent of the total variance. They stated, ". . . the fact that a reader can do well on cloze tasks is no guarantee of overall understanding " (p. 122). Carroll (1972) stated that linguistic clues located in the area of the missing word are the primary element influencing cloze responses. Shanahan, Kamil, and Tobin (1982) assessed the sensitivity of the cloze procedure as a measure of the ability to use information across sentence boundaries. Based on three experiments these researchers concluded that, "it seems to be unreasonable to use and interpret cloze in classroom practice as a global measure of reading comprehension." (p. 250). This appears to indicate that the cloze procedure is tapping some kind of reading ability but not enough to suggest a strong connection to global comprehension.

The present investigator has noticed that many students can perform well on cloze procedures and yet not demonstrate global comprehension of what they have read. McCabe and Pehrsson (in press) found that deaf students were able to demonstrate

understanding of a passage without being able to perform well on the cloze procedure. They related this failure to language problems. The cloze procedure may correlate highly with comprehension because it assesses the ability to make linguistic inferences and this may be an important component which most readers use during reading. Many, but not all, students who can make accurate linguistic inferences based on syntactic and local semantic cues are also good comprehenders. The ability to perform well on a cloze procedure may be more directly related to language processes than to understanding the overall intent of the author and related ideas (global comprehension).

The Op-In Procedure

In attempting to assess global comprehension during the process of reading this investigator developed an assessment approach which seems to combine the in-process value of the cloze procedure but with added emphasis on integrative thinking and global comprehending.

The Op-In Procedure is a type of closure procedure in which sentence endings are deleted from a passage. The passage usually consists of minimally twenty sentences and approximately every other sentence-ending is deleted. There should be at least ten Op-In deletions. Three methods have been tried and all seem adequate for assessments.

1. Delete the main verb and the entire remainder of the sentence.
2. Divide the sentence in half and delete the last half. (For an uneven number of words in a sentence, delete the larger portion.)
3. Retain the first four words and delete the rest of the sentence.

In all of the above methods if there are fewer than five words in a sentence, leave it intact and delete from the following sentence. Questions in the text are also left in tact. The title of the passage is deleted. In place of the deleted sentence ending a line is drawn equal to the length of the page (see example later in this article). This approach is intended for readability levels beyond the primary level. In this Op-In Procedure the student has the option to fill in based on his/her opinion of what the author may have intended: thus the derivation of the term "Op-In." The student may

either write the sentence ending or read the passage (silently or orally) and complete the sentence orally. This can be recorded on tape for later transcription.

Pilot Studies

Pilot studies were conducted with junior high school students. Hundreds of students in both rural and urban areas have been assessed (Pehrsson 1975). The following passage was one used for the development of an Op-In Procedure in which the main verb and remainder of the sentence was deleted. This Op-In Procedure with the author's original sentence endings printed in follows.[2] This will be used for comparing subjects' Op-In responses.

Insert Op-In With Author's Sentence Endings

Brenda, a seventh grade student in the pilot study, had originally read this passage orally in its entirety about six months before doing an Op-In Procedure. At the time of her first reading, Brenda had explained that the passage was about the wolfman and that the wolfman had committed many murders in Miami for fifteen years and he also went to Cleveland and committed many murders. "He would come out when the moon was full," she said, "and he enjoyed going to the ocean and swimming." Her interpretation of the article differed considerably from the author's intent. She made no errors in word accuracy. Generally, Brenda did very well on cloze procedures, scoring fifty to sixty percent by filling in the exact word deleted. However, she very often came up with a story or major idea which differed from the author's original intent. (Usually her stories were more exciting.) At the time that Brenda did the Op-In Procedure, she had little memory of her first reading. She read the passage silently and her oral Op-In (sentence completion) was recorded and later transcribed. Her performance on the Op-In Procedure is demonstrated below.

2 Permission has been granted by Xerox Corporation for reproduction of this article. It appeared in You and Your World, Issue 23, March 20, 1974.

Insert Brenda's Op-In

It appears that Brenda projected her own anticipations and thus completed the sentences with ideas that differed considerably from the author's. In this case, her scheme involved relating ideas to the topic of the wolfman while the author's scheme involved relating ideas to the topic that the moon may affect human behavior.

In this pilot study, another youngster named Missy, an honor student in the same junior high school, also did the Op-In Procedure on the same article without having read the article before. Her Op-In Procedure follows.

Insert Missy's Op-In Procedure

In comparing Missy's Op-In to the original article, in some cases Missy's ideas were very similar and, in one case (Op-In No. 3), exactly the same as the author's. Missy indicated (Op-In No. 6) that scientists choose to measure murders because murders are kept in record form. While the author suggested a less subtle answer to the question. (Her response seems to improve the author's meaning although it differs. It does make sense to gather data that is already available in a record form.) In comparing Missy's academic record to Brenda's record, Missy was scoring very high in all her classes while Brenda was failing in three out of her four major subjects. It is interesting to note, however, that both Missy and Brenda made no miscues when reading their own social studies textbooks. Word identification problems were not present for either student.

In this pilot study, another youngster, Sheila, was also having difficulty in school, but she demonstrated a different scheme as compared to either Brenda or Missy. Her Op-In Procedure on the same passage follows.

Insert Sheila's Op-In

It seems that Sheila did not appear to be integrating information around a topic (either her own or the author's). Her ideas seemed to be fragmented. Her Op-In responses seemed to have related more to the beginning of the sentence (local context) as compared to the overall topic.

Brenda definitely seemed to be integrating information. She was integrating it in terms of her own schema rather than the schema of the author. She was projecting her own intent but not interacting with the author's. Missy seemed to integrate information based on prior context of the sentence, the author's topic, and her own experiences. She interacted with the author, demonstrating anticipation of the same, or similar, meaning as compared to the author's intent. Sheila's responses were fragmented. Her Op-In completions made sense only with the sentence or with the prior sentence. Sheila's Op-In responses demonstrated little or no integration. She did not seem to interact with the author's topic nor did she appear to demonstrate integrative thinking around any topic. Yet she also performed well on most cloze procedures (40-60% range) in her social studies text and made few and usually no miscues while reading orally.

Integration with the author and the integration of ideas around a topic may be important processes connected with global comprehension. Based on pilot studies the Op-In Procedure seemed to demonstrate value in assessing global comprehending.

The Study

An investigation was conducted: (1) to determine if the Op-In Procedure is a valid approach to measuring global comprehending and (2) to determine if patterns of thinking (similar to Brenda's, Missy's and Sheila's) could be discovered related to integrative thinking.

In this study, every other sentence was deleted except for the first four words. If there were five words or fewer in a sentence, that sentence would be left intact and the ending of the next sentence would be deleted. Three passages[3], written on

3 Reading for Concepts. (Level F), New York: Webster-McGraw-Hill, 1972.

sixth grade level dealing basically with scientific concepts, were chosen for the study. The scientific concepts were that of quicksand, mirages, and looming. Each of these three passages were prepared in three different ways. Each passage was developed into a cloze procedure, an Op-In Procedure, and a comprehension question task with emphasis on main idea, and topic-related connections (global comprehension). Five multiple-choice questions were developed for each passage. Titles were deleted in all three methods of assessments. Both passages and methods were controlled for order of presentation. All three activities were performed within one week.

Ninety-six seventh grade subjects from two junior high schools participated in the study. Students were selected from both urban and rural environments. All students had previous experiences with comprehension question tasks and also with the cloze procedure. Special instructions were given for the Op-In Procedure. Students were asked to complete the sentences by writing in their own words. They were assured that they were not expected to guess exactly what the author said.

Analysis

Responses were grouped into one of five categories and rated on a 4 to 0 scale. This form of categorizing responses developed out of the pilot studies.

1. Same or very similar to author's intent (4 points).
2. Different from author's intent but makes sense and contributes to author's topic (3 points).
3. Different from and fails to contribute to author's topic but logically demonstrates integration of reader's topic (2 points).
4. Makes sense only in local context, fails to contribute to any topic or simple repetition (1 point).
5. Fails to make sense, far off topic, vague (0 point).

For the cloze procedure and comprehension question tasks, raw scores were easily derived. However, for the Op-In Procedure, responses were categorized twice

independently by two judges with an interrater reliability of .88. All final scores were agreed on by consensus of the two judges.

Results

Comprehension questions and the Op-In percentage (total raw score divided by possible total score) scores yielded a correlation of .722 while cloze procedure and global comprehension questions yielded a correlation of .498. A regression analysis indicated that the correlation between the comprehension scores and the Op-In Procedure was significant ($F = 34.6$) at the .01 level. The regression analysis indicated that the correlation between the cloze procedure and comprehension questions was not significant ($F = 4.3$). The Op-In Procedure appears to be a valid approach to assessing global comprehending during the process of reading. Although the cloze procedure may have value, it appears questionable as to whether it should be used as an approach closely tied to global comprehension.

Patterns did emerge. Most subjects used one of the following patterns:

1. interactive pattern (like Missy, some subjects used both author's and reader's schemes to integrate meanings),
2. projective pattern (like Brenda, some subjects used mostly reader's own scheme to integrate meanings),
3. fragmented pattern (like Sheila, some subjects used local context such as beginning of sentence without integrating any scheme),
4. no pattern determined (some students seemed to change patterns and were inconsistent).

If the subject's response was determined to be the same, very similar to the author's intent, or different but contributed to the author's topic, it was classified as interactive. The response was classified as projective if it was different, failed to contribute to the author's topic but related to the reader's topic. If the response made sense only in a local context (beginning of sentence or prior sentence), failed to contribute to

any topic, failed to make sense, was far off the topic or was vauge, the response was categorized as fragmented.

A pattern was determined if a subject's Op-In responses fit into one of the categories at least fifty percent of the time. The patterns were divided rather evenly among the ninety-six subjects.

1. Interactive pattern - 22 students.
2. Projective pattern - 28 students.
3. Fragmented pattern - 26 students.
4. No pattern determined - 20 students.

According to the method of scoring established prior to the analysis of data, the students who were categorized as interactive achieved the highest score while those who were categorized as fragmented received the lowest. Those with no pattern observed were mixed in their achievement levels. The following charts were used to score and categorize Brenda's, Missy's and Sheila's Op-In Procedure.

Insert Three Charts of Op-In Analysis

Conclusion

The Op-In Procedure exposes global comprehension processes as well as deviations from them in an interesting way. Some readers seem to use, primarily, the graphic information just prior to the deletion without developing presuppositions about the author's scheme or using prior world experiences. They seem to think in fragments rather than to keep in mind the overall topic. Other readers seem to use graphic information on the page in conjunction with their previous world experiences but neglect the development of presuppositions about the author's scheme. They integrate by assimilating without accommodating to the author's intent. The proficient readers, however, make use of graphic information, their own previous world experiences, as

well as consistently developing more and more accurate presuppositions about the author's scheme.

A proficient reader appears to be able to pull information from three sources: presuppositions regarding the author's intended meaning, prior world experience related to the author's topic, and graphic information on the page. During reading, the reader develops presuppositions regarding the author's scheme. These presuppositions are based, in part, on the topic and related ideas already read. The reader then activates his or her own scheme and draws on previous world experiences related to the topic. The reader then anticipates what will be on the page, makes inferences, and selectively regards graphic information on the page. That information is then matched against the scheme and adjustments are made involving accepting, refining, or rejecting either the schemes or the graphic information.

The Op-In Procedure may be consistent with bottom-up, top-down, and interactive models of reading (Wildman and Kling, 1978-79). Readers who were classified in the fragmented category may be using a bottom-up model. Readers who project their own ideas without regard to the author's intent may be using a pure top-down model. The readers who integrate their previous experiences with the experiences intended by the author through the development of presuppositions and, additionally, use the graphic information, may be using an interactive model of reading, perhaps the most ideal model.

The Op-In Procedure appears to deal with the processes involved in thinking during silent reading and seems to assess global comprehension. The Op-In Procedure allows for monitoring and assessing comprehending easily, efficiently, and with a minimal amount of interference during the very act of reading. It is hoped that this study will open the door to more in-depth research involving integrative thinking during reading.

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AUTHOR'S ORIGINAL SENTENCE ENDINGS

1 Everyone knows the story of the wolfman. When the moon was full, he TURNED INTO A MONSTER. And he did terrible things.

Can the moon really make people mean and does the moon really have something to do with the way people act? Two scientists here at Miami's School of Medicine

2 HAVE MADE A NEW DISCOVERY.

They found that the moon does seem to affect the way people behave. Dr. Arnold Lieber

3 and Dr. Carolyn Sherin DID A STUDY. They checked the dates of murders in the Miami area over a

4 15 year time period (1956-70). They FOUND THAT MANY MORE MURDERS TOOK PLACE DURING THE FULL MOON OR THE NEW MOON THAN AT OTHER TIMES

Then they studied the murders in the Cleveland (Ohio) area for a 13 year period

5 (1958-70). Their findings there WERE ABOUT THE SAME. More murders took place at the time of the new or full moon.

Why did the scientists choose to measure murders? Murders

6 ARE VIOLENT ACTS. If the changes of the moon have something to do with murders, they may have something to do with all violent acts. Does this mean we're all a little moon mad? No. But it

7 DOES SUGGEST THAT THE CHANGES OF THE MOON MAY HAVE SOMETHING TO DO WITH PEOPLE'S BEHAVIOR.

Scientists have known for a long time that the moon pulls on the waters of the earth. The pull of the moon

8 CAUSES THE WATER OF THE WORLD'S OCEANS TO RISE. This is what is known as tides. The pull of the moon

9 IS STRONGEST AT THE TIME OF THE NEW OR FULL MOON.

This stronger pull causes higher tides. Scientists also

10 KNOW THAT THE HUMAN BODY IS MOSTLY WATER. And now this study makes some scientists wonder. Could the pull of the moon

11 CHANGE THE WATERS OF THE HUMAN BODY? And could such changes make certain people - or all people - more likely to be violent?

BRENDA

Everyone knows the story of the wolfman. When the moon was full, he GREW
1 HAIR ALL OVER HIMSELF. And he did terrib e things.

Can the moon really make people mean and does the moon really have something to do with the way people act? Two scientists here at Miami's School of Medicine
2 IN FLORIDA STUDIED THE WOLFMAN.
They found that the moon does seem to affect the way people behave. Dr. Arnold Lieber and Dr. Carolyn Sherin
3 WERE TWO DOCTORS. They checked the dates of murders in the Miami area over a 15 year time period (1956-70). They FOUND THAT THE WOLFMAN COMMITTED MANY
4 MURDERS.

Then they studied the murders in the Cleveland (Ohio) area for a 13 year period (1958-70). Their findings there
5 WERE THAT THE WOLFMAN KILLED MANY PEOPLE. More murders took place at the time of the new or full moon.

Why did the scientists choose to measure murders? Murders
6 ARE COMMITTED WHEN HE TURNS INTO A WOLF. If the changes of the moon have something to do with murders, they may have something to do with all violent acts. Does this mean we're all a little moon mad? No. But it
7 IS TRUE THAT THE WOLFMAN KILLS PEOPLE.

Scientists have known for a long time that the moon pulls on the waters of the earth. The pull of the moon
8 MAKES THE WOLFMAN KILL MANY PEOPLE. This is what is known as tides. The pull of the moon
9 MAKES HIM DO IT.
This stronger pull causes higher tides. Scientists also
10 THINK HE DOES OTHER BAD THINGS. And now this study makes some scientists wonder. Could the pull of the moon
11 TURN THE WOLFMAN CRAZY? And could such changes make certain people - or all people - more likely to be violent?

MISSY

Everyone knows the story of the wolfman. When the moon was full, he WOULD
1 TURN INTO A MONSTER WITH HAIR ALL OVER. And he did terrible things.

Can the moon really make people mean and does the moon really have something to do with the way people act? Two scientists here at Miami's School of Medicine
2 HAVE INVESTIGATED THIS PROBLEM. They found that the moon does seem to affect the way people behave. Dr. Arnold Lieber
3 and Dr. Carolyn Sherin DID A STUDY. They checked the dates of murders in the Miami area over a 15 year time period (1956-70). They
4 FOUND THAT THERE WERE MANY MURDERS WHEN THERE WAS A FULL MOON.

Then they studied the murders in the Cleveland (Ohio) area for a 13 year period
5 (1958-70). Their findings there WERE PRETTY MUCH THE SAME AS IN MIAMI. More murders took place at the time of the new or full moon.

Why did the scientists choose to measure murders? Murders ARE KEPT IN
6 RECORD FORMS. If the changes of the moon have something to do with murders, they may have something to do with all violent acts. Does this mean we're all a little moon mad? No. But it MIGHT
7 MEAN THAT THE MOON COULD HAVE SOMETHING TO DO WITH VIOLENT ACTS.

Scientists have known for a long time that the moon pulls on the waters of the
8 earth. The pull of the moon MIGHT HAVE SOMETHING TO DO WITH THE MURDERS. This is what is known as tides. The pull of the moon
9 PULLS AND CAUSES WATER TO RISE VERY HIGH AT TIMES OF THE FULL MOON. This stronger pull causes higher tides. Scientists also STUDY HOW THIS IS
10 RELATED TO VIOLENCE. And now this study makes some scientists wonder. Could the pull of the moon
11 CAUSE PEOPLE TO BE MORE VIOLENT? And could such changes make certain people - or all people - more likely to be violent?

SHEILA

Everyone knows the story of the wolfman. When the moon was full, he TURNED INTO A WOLF. And he did terrible things.

Can the moon really make people mean and does the moon really have something to do with the way people act? Two scientists here at Miami's School of Medicine STUDIED TO BE DOCTORS. They found that the moon does seem to affect the way people behave. Dr. Arnold Lieber and Dr. Carolyn Sherin WERE GOOD FRIENDS. They checked the dates of murders in the Miami area over a 15 year time period (1956-70). They WERE TWO DOCTORS.

Then they studied the murders in the Cleveland (Ohio) area for a 13 year period (1958-70). Their findings there WERE LOOKING FOR. More murders took place at the time of the new or full moon.

Why did the scientists choose to measure murders? Murders ARE WHEN YOU KILL PEOPLE. If the changes of the moon have something to do with murders, they may have something to do with all violent acts. Does this mean we're all a little moon mad? No. But it IS NOT GOOD TO GET REALLY MAD.

Scientists have known for a long time that the moon pulls on the waters of the earth. The pull of the moon KEEPS THE MOON GOING AROUND THE EARTH. This is what is known as tides. The pull of the moon IS VERY STRONG. This stronger pull causes higher tides. Scientists also ARE VERY SMART PEOPLE. And now this study makes some scientists wonder. Could the pull of the moon BE MADE STRONGER? And could such changes make certain people - or all people - more likely to be violent?

Name BRENDA

Op-In Category	Interactive		Projective		Fragmented
Op-In Number	same or very similar to author's intent.	different but contributes to author's topic	different, fails to contribute to author's topic but relates to reader's topic	makes sense only in local context - fails to contribute to any topic	fails to make sense, far off topic, vague
Points	4	3	2	1	0
1		*			
2			*		
3				*	
4			*		
5			*		
6			*		
7			*		
8			*		
9			*		
10			*		
11			*		
12					
Totals	0	3	18	1	0

$= \frac{22}{44} = 50\ \%$

Pattern (50% or more in a category)

Interactive _____

Projective *

Fragmented _____

$\frac{\text{Total Raw Score}}{\text{Possible Total Score}} = \%$

ame MISSY

Op-In Category	Interactive		Projective		Fragmented
Op-In Number	same or very similar to author's intent.	different but contributes to author's topic	different, fails to contribute to author's topic but relates to reader's topic	makes sense only in local context - fails to contribute to any topic	fails to make sense, far off topic, vague
Points	4	3	2	1	0
1	*				
2		*			
3	*				
4	*				
5	*				
6		*			
7		*			
8		*			
9	*				
10		*			
11		*			
12					
Totals	20	18	0	0	0

$= \frac{38}{44} = 86$ %

Pattern (50% or more in a category)

Interactive *

Projective

Fragmented

Total Raw Score / Possible Total Score = %

Name SHEILA

Op-In Category	Interactive		Projective		Fragmented
Op-In Number	same or very similar to author's intent.	different but contributes to author's topic	different, fails to contribute to author's topic but relates to reader's topic	makes sense only in local context, fails to contribute to any topic	fails to make sense, far off topic, vague
Points	4	3	2	1	0
1		*			
2				*	
3				*	
4				*	
5					*
6				*	
7				*	
8				*	
9				*	
10				*	
11				*	
12					
Totals	0	3	0	9	0

$= \frac{12}{44} = 27\ \%$

Pattern (50% or more in a category)

Interactive _____

Projective _____

Fragmented *

$\frac{\text{Total Raw Score}}{\text{Possible Total Score}} = \%$